STORMWATER DECISION FRAMEWORK

Goal: The purpose of the stormwater decision framework is to determine whether stormwater discharges are a potential source of recontamination to sediments in the Removal Action Boundary (RAB).

Challenges

- **Low Total Suspended Solids (TSS).** The Jorgensen Forge Corporation (JFC) stormwater treatment system was designed to, and effectively removes, most settleable solids. Based on review of approximately 15 months of JFC's post-treatment effluent TSS readings, TSS has consistently been less than 10 milligrams per liter (mg/l) TSS. The concentration of TSS present has not been measured accurately and is unknown.

- **Small Drainage Area.** JFC's drainage area is small at 12.4 acres.

- **Large Sampling Volumes Required.** Low TSS and a small drainage area make use of sediment traps or Isco automated samplers impractical for collecting stormwater solids samples, due to the lower TSS and flows than in other drainage basins where these samplers have been used. Natural systems with low TSS (e.g., USGS sampling of particulates in the Green River) have required as much as 1,000 gallons of water per sample to obtain sufficient solids to analyze for COCs.

  For Outfall 003, Farallon calculated the sample volume that may be needed to collect a sufficient volume of stormwater solids to analyze for the COCs. The maximum concentration of TSS that could be present in stormwater is 10 mg/l (or 0.01 gm/l), since TSS has been non-detect at that concentration. Analysis for the COCs will require a minimum of 150 gm of solids, particularly to reach the lower detection limits for PCBs. The volume of stormwater required to obtain sufficient solids for analysis is a minimum of 15,000 liters, or nearly 4,000 gallons. In practice, the volume of water may be twice that, since the actual concentration of TSS in the effluent is likely no higher than 5 mg/l, based on one detected value at that concentration. In addition, centrifugation efficiency to extract the solids from the stormwater sample is likely less than 100 percent, particularly for finer particles.

- **Lack of Sampling Systems.** Farallon has not identified a readily available sampling system that can be employed to collect sufficient stormwater solids for quarterly, or even less frequent, monitoring of COCs for these sample volumes.

- **Custom Sampling System Design.** It may be possible to design and construct a site-specific sampling system for the JFC stormwater system such as a pump-and-filter system or either onsite or in-laboratory centrifuging. To properly design the system, initial sampling to determine the TSS and particle size distribution is needed, along with a pilot test of the designed system to ensure adequate sample collection.

- **Variability.** There is unknown and substantial variability between sampling events, seasons, and years in stormwater flow and TSS. Because of this variability, several years

of stormwater data may be needed to effectively model long-term impacts. Sediment data may more effectively integrate concentrations over time.

Additional Considerations

- **Source Screening.** Due to the effort and equipment required, sampling of solids in stormwater systems is typically prioritized to basins where there is clear evidence that sediments offshore of an outfall have been impacted by the discharge. This initial screening step should be conducted as part of the stormwater decision framework.

- **No Current Evidence of Impacts.** Existing and recently collected sediment data near Outfall 003 does not suggest that it is an ongoing source of COCs in stormwater discharge to the sediments.

- **Particle Size and Settling.** JFC's stormwater treatment system removes most settleable particles, and it is likely that the remaining TSS in the post-treatment effluent does not settle near the outfall. Particle size distribution data in combination with regional particle tracing and modeling studies conducted by Ecology and King County would help determine whether TSS remaining in the discharge is settleable.

Proposed Stormwater Decision Framework

EMJ is proposing to increase sediment monitoring to provide additional data to support both the stormwater and groundwater decision frameworks. Sediment monitoring would be conducted annually for all stations sampled under OMMP Addendum No. 2. In addition to sampling the 0-10 cm interval, EMJ also proposes sampling the 0-2 cm interval to better reflect recent deposition and changes in concentrations due to sources that may be present. There may be a need to revise some station locations in consultation with EPA to better distinguish among potential sources.

Taking all of these factors into consideration, the following two-tier stormwater decision framework is proposed.

Tier I

- **Stormwater Quality.** Comparison of stormwater quality data to the surface water screening levels.

- **Sediment Concentration Gradients.** Analysis of concentration gradients in the array of sediment sampling stations selected to monitor sediments in proximity to Outfall 003. Gradients showing increasing concentrations in surface sediments (0-2 cm) toward the outfall would trigger Tier II even if the concentrations were currently below the RvALs.

- **Sediment Concentration Trends.** Analysis of trends over time in the array of sediment sampling stations selected to monitor Outfall 003. Increasing trends in sediments close to the outfall would trigger Tier II even if the concentrations were currently below the RvALs.

- **Accumulation of Fines.** Measurement of the depth of fines deposition in the array of sediment sampling stations selected to monitor Outfall 003. This information would be a

qualitative line of evidence used to interpret the chemistry data and could provide evidence of solids deposition from the outfall.

- **Source Evaluation.** Concurrent evaluation of the other potential sources to sediments for any stations exceeding the RvALs using similar decision frameworks, to help distinguish among sources and review the data holistically. Potential sources include groundwater, bank soil erosion, sediment bedload transport from sediments upstream or offshore of the RAB, and in-water deposition of fines from LDW water column sources.

- **Stormwater Solids Characterization.** Collection of stormwater TSS and particle size distribution data needed to design a solids sampling system and for modeling of potential effluent impacts to sediments. Farallon will use this information to design a custom stormwater solids sampling system for JFC if Tier II is warranted.

- **Settleability Evaluation.** Evaluation of the settleability of stormwater particle sizes using the results of regional particle tracing studies and stormwater modeling and/or laboratory testing. The Washington State Department of Ecology Environmental Assessment Program's particle tracing study for the LDW and/or King County's Environment Fluid Dynamics Code (EFDC)-derived simple discharge model could be used to evaluate whether the particles present in the effluent may settle out near the outfall. Settleable particle sizes along with fines deposition near the outfall would be used to determine the potential for deposition of stormwater solids on the RAB.

Tier II

- **Stormwater Solids Sampling and Analysis.** Collection and analysis of stormwater solids for the COCs using the designed stormwater sampling system. If, in any given sampling period, there is insufficient flow or TSS to analyze for all COCs, the priority for analyses described in EPA's comments will be followed.

- **Sediment Impact Modeling.** Modeling of the potential impacts of the effluent discharge on sediments using TSS, flow, particle size, and chemistry data. The results will be compared to the screening levels for sediments (RvALs).

Contingency Response Actions

- **Source Control.** Exceedance of surface water or sediment screening levels in Tier I or Tier II associated with outfall discharges would be reported to EPA and Ecology for consideration of further source control actions. This would be coordinated with JFC's NPDES permit.

- **RAB Maintenance.** The goal of Tier I and Tier II is to protect the RAB by identifying potential RvAL exceedances in sediments before they occur and facilitating timely source reductions. Should an area of the RAB be impacted by Outfall 003 to sediment concentrations exceeding the RvALs, source control would first need to be conducted and verified, after which maintenance actions such as monitored natural recovery, enhanced monitored natural recovery, or a thin cap could be considered. Such actions would be

considered in the context of any observed recontamination related to river-wide sources and the final design and timing of the remedy for surrounding areas of the LDW.